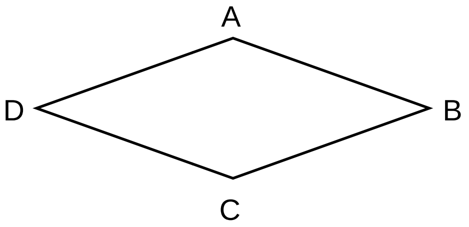
Higher Check In - 8.04 Properties of polygons

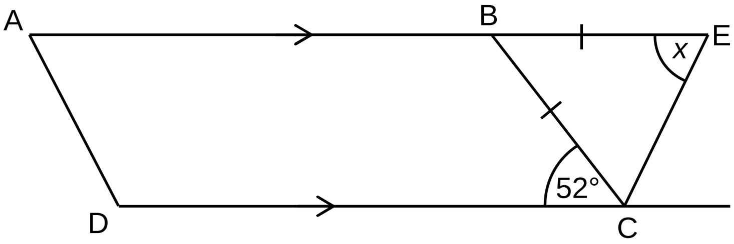
1. Triangle PQR is isosceles with PR = QR. Angle PQR = 57°. Find angle QRP.

2. ABCD is a rhombus. If $\angle ADB = 18°$, calculate the size of $\angle ACB$.



Not to scale

3. Find the size of angle *x* in the diagram below.



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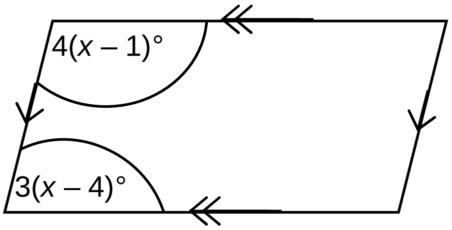
4. In a triangle, the first angle is a right angle and the second angle is 5 times the size of the third angle. Find the size of all three angles.

5. Work out the size of each angle in the quadrilateral below.



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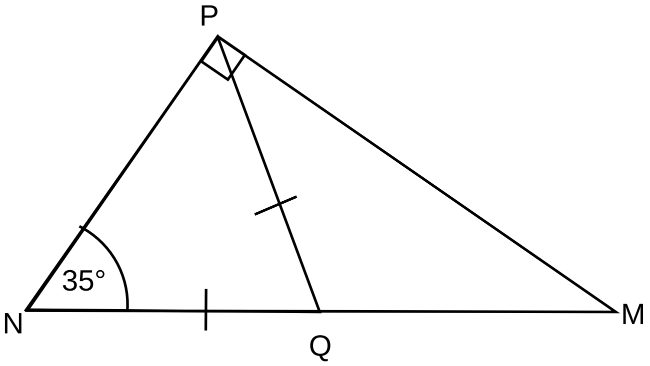
6. Show that triangle MPQ is isosceles.



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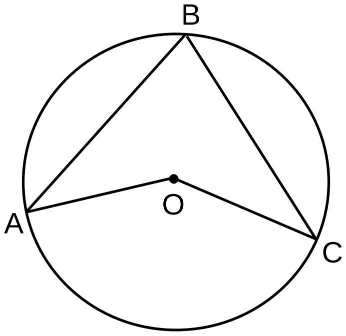
7. A, B and C are points on the circumference of a circle, centre O.
Given that the $\angle BAO = \angle BCO$, prove that $AB = BC$.



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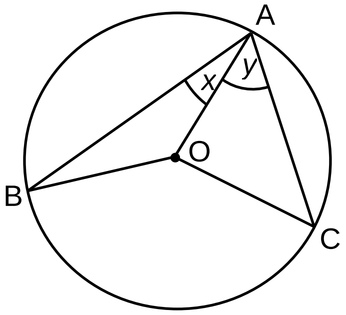
8. Points A, B and C are on the circumference of the circle, centre O.
By considering the triangles OAB and OAC, prove that the obtuse angle $BOC = 2(x + y)$.



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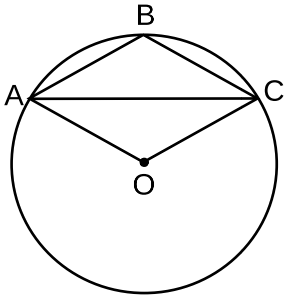
9. Points A, B and C are on the circumference of the circle, centre O.
Given that $AB = OC$, find the value of angle OAC.



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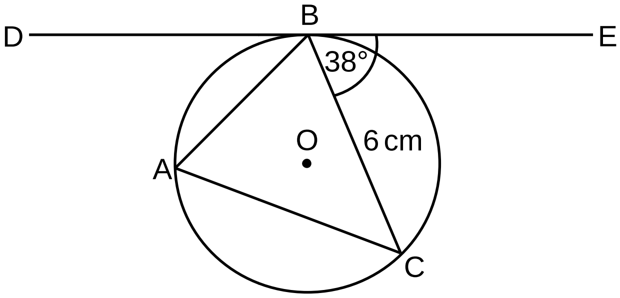
10. Points A, B and C are on the circumference of the circle, centre O.
None of the chords AB, AC or BC go through the centre of the circle.
DE is a tangent and touches the circle at point B.
Find the length of the radius of the circle.



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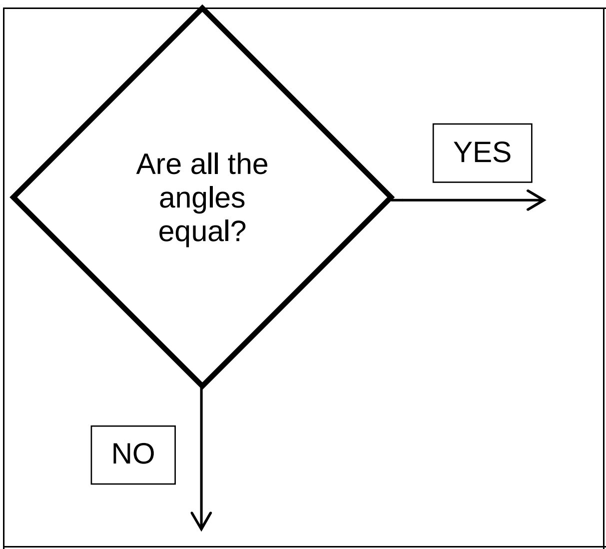
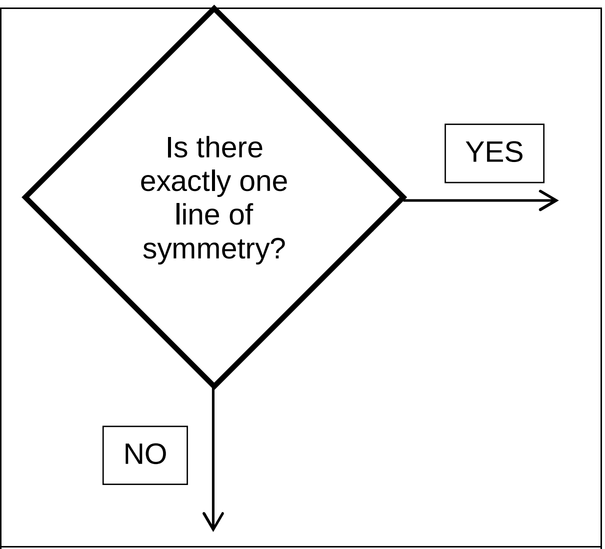
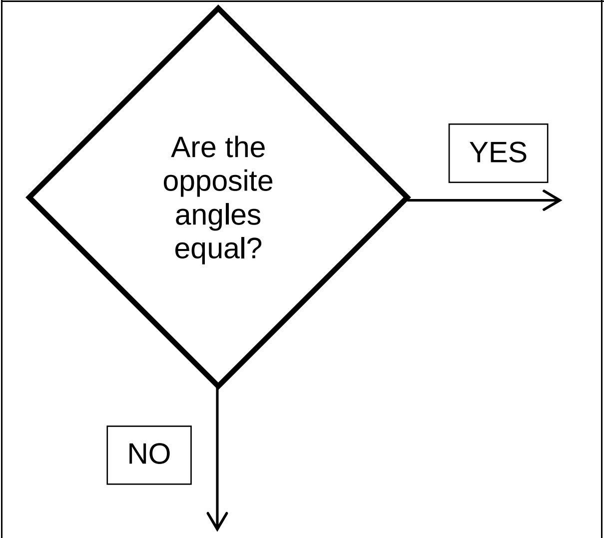
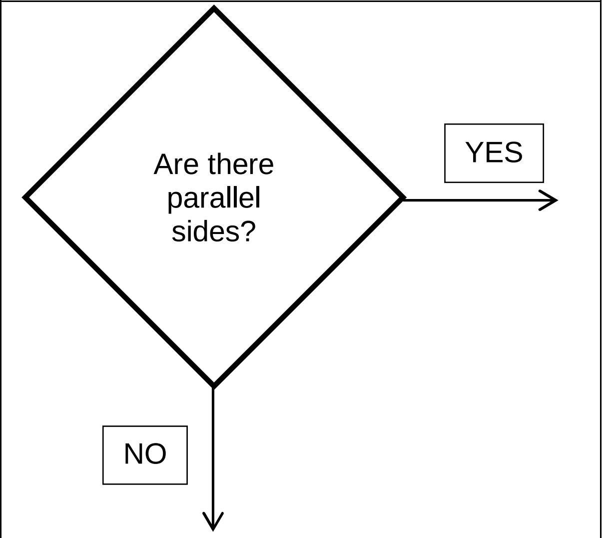
Extension

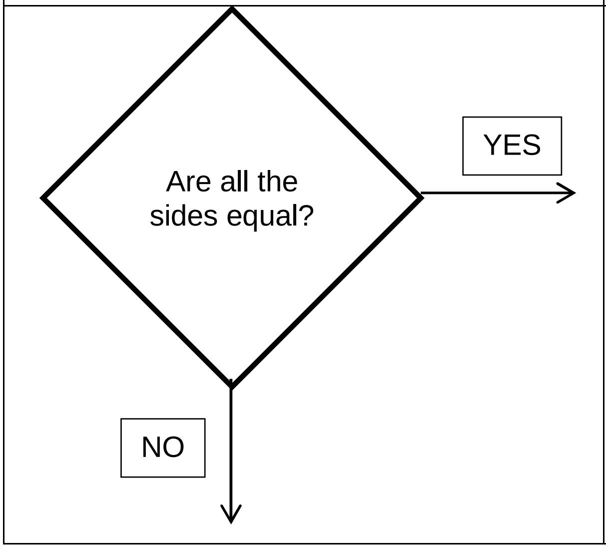
Cut out and arrange the decision boxes to form a flow chart for distinguishing between quadrilaterals (square, parallelogram, trapezium, rectangle, kite, rhombus and non-specific general quadrilateral).

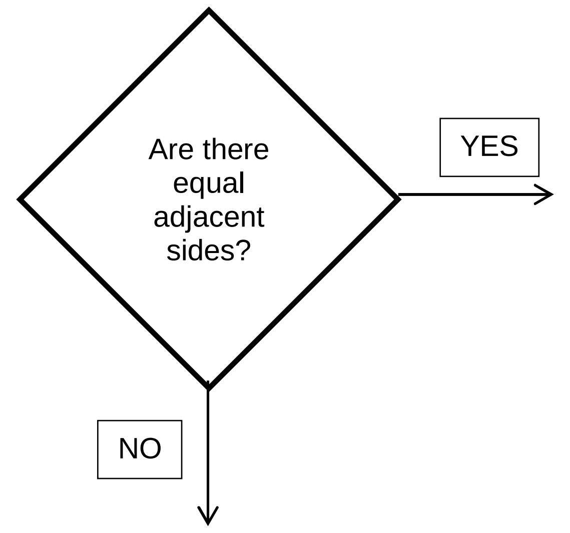












Answers

1. 66°

2. 72°

3. $x = 64°$

4. 90°, 15° and 75°

5. 72°, 108°, 72°, 108°

6. Given that NQ = QP, $\angle$QNP = $\angle$QPN = 35° $\therefore \angle$NQP = 180 – (35 + 35) = 110°
   (sum of angles in a triangle is 180°).
   Given that $\angle$NPM = 90°, $\angle$QPM = 90 – 35 = 55° and
   $\angle$NMP = 180 – (90 + 35) = 55° (sum of angles in a triangle is 180°).
   $\angle$QPM = $\angle$NMP $\therefore$ triangle MPQ is isosceles.

7. OA = OB = OC as they are radii of the circle
   $\therefore$ triangles OAB and OBC are isosceles
   $\therefore$ triangles OAB and OBC are congruent, SAS so AB = BC.

8. OA = OB = OC as they are all radii of the circle
   $\therefore$ triangles OAB and OAC are isosceles
   $\therefore$ angle ABO = x because base angles of an isosceles triangle are equal.
   Similarly angle ACO = y, because base angles of an isosceles triangle are equal.
   Angle AOB = $180 - 2x$ because sum of angles in a triangle is 180°.
   Similarly angle AOC = $180 - 2y$

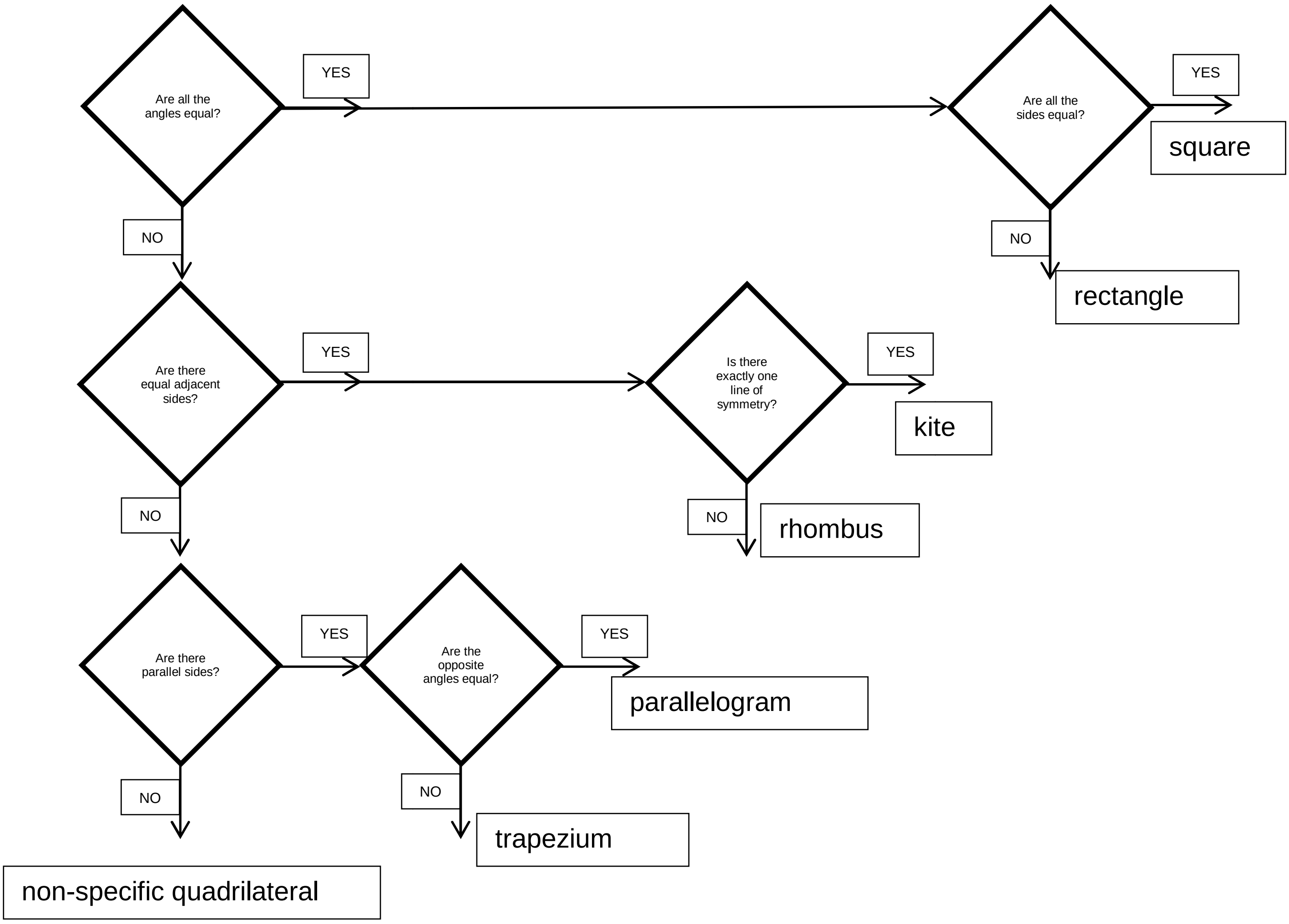
$$\begin{aligned} \therefore \text{ angle BOC } &= 360 - (180 - 2x) - (180 - 2y) \\ &= 2x + 2y \\ &= 2(x + y) \end{aligned}$$

9. Given AB = OC and OC = OA = OB (radii) then triangles AOB and BOC are
   equilateral triangles and ABCO is a rhombus.
   $\therefore$ OAB = 60° so CAB = 30°.

10. 4.87 cm

Extension

One possible arrangement:



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AO1	1	Use the properties of an isosceles triangle to find an angle			
AO1	2	Use the properties of a rhombus to find an angle			
AO1	3	Use the properties of a trapezium and an isosceles triangle to find an angle			
AO1	4	Use the properties of a right-angled triangle to find an angle			
AO1	5	Use the properties of a parallelogram to find an angle			
AO2	6	Use the properties of an isosceles triangle in a simple proof			
AO2	7	Use the properties of triangles in a proof involving circle theorems			
AO2	8	Use the properties of triangles in a proof involving circle theorems			
AO3	9	Use the properties of triangles and quadrilaterals in circle theorems to find an angle			
AO3	10	Use the properties of triangles in circle theorems to find a length			

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